DOCUMENT RESUME

ED 297 410 CS 506 313

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TITLE Questioning Strategies To Encourage Critical Thinking.
INSTITUTION North Dakota Univ., Grand Forks. Center for Teaching and Learning.
PUB DATE Sep 88
NOTE 11p.
PUB TYPE Journal Articles (080) -- Reports - Descriptive (141) -- Guides - Classroom Use - Guides (For Teachers) (052)
JOURNAL CIT Insights into Open Education; v21 n1 Sep 1988

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academically Gifted; *Classroom Environment; Classroom Research; *Classroom Techniques; *Critical Thinking; Deduction; Grade 4; Intermediate Grades; Naturalistic Observation; *Questioning Techniques; Teaching Methods
IDENTIFIERS Open Ended Questions

ABSTRACT

In an attempt to explore the type of classroom environment that contributes to the development of critical thinking, and the questioning techniques and strategies employed there, prolonged observation was conducted in a fourth grade gifted classroom. The teacher of this classroom attempted to relate all her questioning strategies to the enhancement of higher level thinking skills. Open-ended questions (not having one right answer) encouraged independent critical thought as well as creativity. The children understood that all thoughtful responses to questions were valued. Deductive reasoning was fostered by activities such as "Mind Benders" and "Stories To Stretch Minds," requiring the children to put together clues to arrive logically at a conclusion. The few activities requiring one right answer necessitated the use of reference materials to find that answer, thus reinforcing research skills. The teacher provided guidance and direction, but rarely answers. Knowledge in this classroom was not presented to students by the teacher. Rather, the students generated their own knowledge through the application, analysis, synthesis, and evaluation of ideas. (Six references are attached.) (SR)

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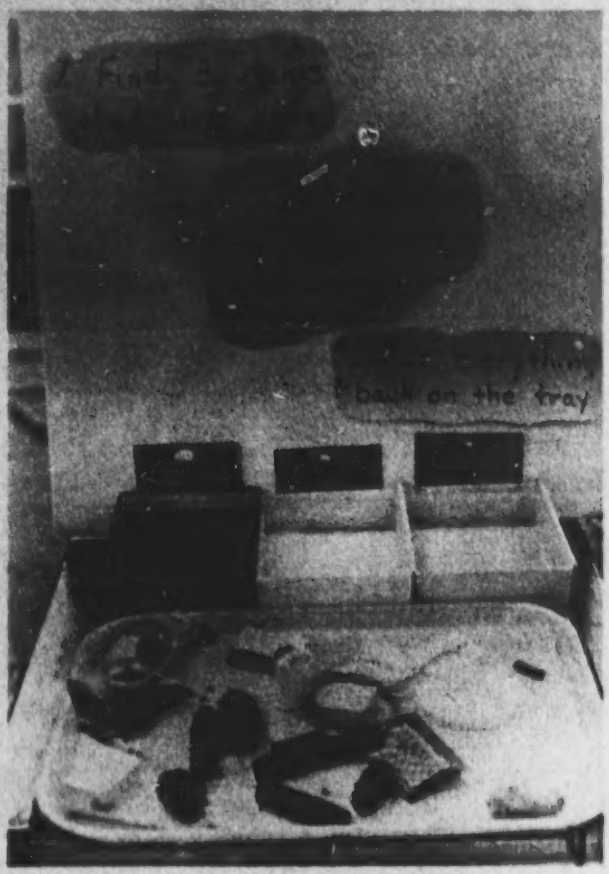

CENTER FOR TEACHING AND LEARNING
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS 58202

Volume 21, Number 1
September 1988

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by

Hilary L. Pollack

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INSIGHTS into open education

Questioning Strategies to Encourage Critical Thinking

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The importance of questioning techniques and strategies has received a great deal of attention from educators and writers of educational materials. Volumes have been written about how to design questions for various teaching and learning objectives. The type of questions that a teacher poses can set the tone of a classroom and contribute significantly to the classroom climate. Questions that are asked can define a classroom as one where rote memory is valued or one where children are encouraged to be thoughtful and pursue ideas. Transference of academic skills to life situations can result from certain questioning strategies for "the ability to ask effective questions is necessary for quality teaching that will enable students to participate fully in the world" (Hunkins, 1972, p. 135).

In an attempt to explore the type of classroom environment that contributes to the development of critical thinking, prolonged observation was conducted in a fourth grade gifted classroom. The primary goal of this program is to develop critical thinking. Kathy, the teacher, was very thoughtful about the types of questions that she posed and attempted to relate all of her questioning strategies to the enhancement of higher level thinking skills.

There were basically three types of questions that were asked in this class. Many of the questions that the children encountered were open-ended, in that there was no right answer and the children were urged to be creative and innovative. Other questions did require a particular response, but that response was obtained through a process, often quite lengthy, of deductive reasoning. The few activities that the children did that demanded one simple right answer necessitated the use of reference materials to find that answer. All of these types of questions can foster the development of critical thinking. Children in this classroom were never asked to respond to questions without some sort of prior thought process.

Open-Ended Questions

Open-ended questions that do not have one right answer are a particularly important strategy for the teacher who wishes to encourage independent critical thought in her students. The myth of one right answer to every question is antithetical to the spirit of critical thinking which is based on doubt and skepticism. Indeed, ". . . the myth of the right answer . . . fosters an illusion of knowing that subverts construction of a functional knowledge base for critical thinking" (Cornbleth, 1985, p. 31). Questions that call for only one correct response tend to block discussion and inhibit cognitive thinking and reasoning (Ciardiello, 1986). Children in this gifted classroom understood that all thoughtful responses to questions were valued. If a response was clearly not acceptable, then the avenue that led to that response was evaluated by teacher and students. Children were never evaluated solely on the basis of right

or wrong answers. The use of open-ended questioning in a classroom can be somewhat threatening to teachers because of the lack of guidelines in evaluating children's responses (Goodlad, 1984). Kathy felt, however, that the inclusion of these types of questions in her curriculum was essential for the development of critical thinking skills. "If the kids know that you expect a certain answer all of the time, they won't attempt any kind of creative thinking," she explained. "They can come to a real closure in their minds."

The Centers in which the children participated contained many examples of open-ended questions. The children worked on Centers for about 30 to 90 minutes of each class period. Centers were a self-directed activity that children pursued at their own pace. Requirements were established as to how many activities the children were expected to complete and in what time frame. The Centers were varied as to the subject matter that they covered and the strategies that they employed. At the Creativity Tree, a Center designed to encourage creativity, students were asked to make a list of things that reflect, speculate on how life would be different without daydreams, give taste to something tasteless, draw a picture of a rainbow stirred up, list words in which verbs can be found, and make a recipe for a happy life, among other things.

Marty worked for several class periods on a project from the Creativity Tree which involved finding as many rectangles as he could by folding a single piece of paper. He saw immediately that there were rectangles within rectangles, and spent several minutes folding the paper as small as he could, opening it, and attempting to count the rectangles that he saw. "I don't know how to keep track," he mourned. "There are so many!" When Marty had a conference with Kathy about this activity, he brought his folded paper to her desk and began to point out to her the myriad of rectangles that he saw within the piece of paper. "Hold it, hold it," Kathy cautioned. "I need to see documentation. You need to document your work." "But how?" Marty asked in confusion. Kathy showed him how to diagram different possibilities and then record the number of rectangles in each array. Marty went back to his seat excited to have a system to keep track of the rectangles. Kathy had made it clear to him that although there was not one right answer to this exercise, there were certain expectations, and he would have to fulfill the expectations to get credit for his work. In this problem, as in many others in this classroom, the expectations centered around the process that the children used to arrive at their answers, rather than at the answer itself. Later in the day Marty was still working on the same problem. "I found 304 rectangles, and I'm still counting!" he boasted. "Can you believe it?" He was amazed at his own progress and extremely motivated by his success. "How did you find so many?" I asked him. "Well, first I just looked at it, and then doodled around and kept thinking of more," he explained. "Sometimes I just looked at it to think of more. It definitely helped to write it down. After a while I started looking at just part of the paper, like one-fourth, and then multiplying what I found there by four. That was a good way to find the little rectangles that were inside the bigger ones. But I also had to look back at the whole sheet of paper to see the big picture." The open-ended nature of this task and a little direction from Kathy

prompted Marty to analyze and evaluate the way in which he approached the task and to continually look for ways to improve his process.

Will was trying to respond to the question from the Creativity Tree, "What jobs are related to the color green?" He was writing ideas on his paper, thinking for a while, and then writing again. When he felt that he had enough, he signed up for a conference. As he was waiting he shared his list with me. "I have a gardener, a mint worker, a UND basketball player, a paint-maker, a flower salesman, an NDSU hockey player, a UND swimmer, a painter, a grocer in a vegetable market, a farmer, the combine driver at a pea farm, and the leader of a St. Patrick's Day parade. I can't think of any more." "Do you have to think of a certain number?" I wondered. "No, I don't think so," Will replied. "As long as we try and think of as many as we can." Will's task was approved, and he moved on to the next activity.

Deductive Reasoning

Questioning that generated deductive thinking, when children put together clues to logically arrive at a conclusion, was an important part of the curriculum in this gifted program. Children enjoyed the challenge of these activities and welcomed the mental exercise that they provided. Most of the deductive thinking in which the children engaged was limited to the context of the particular problem or activity which they were tackling. Educators question the ability of children to transfer this type of thinking from the hypothetical models that were posed in the classroom to real life situations. Many teachers feel, however, that the practice of approaching a problem in a particular way is applicable to many situations. Kathy justified the inclusion of activities that focused on a particular style of critical thinking in her curriculum. "Those things are fun and help to get the kids on the right track," she explained. "The kids get into a way of approaching things."

Mind Benders were a series of activities on which children worked individually or in pairs. The primary focus of this activity was to develop specific thinking skills. "Who knows what deductive thinking is?" Kathy challenged her students. "Logic," replied Vanessa; "Weird," suggested Scott; "Mind Benders," guessed Marty. Kathy prompted the children, "Sherlock Holmes used deductive thinking." "You go by the clues," reasoned Jessica. "Good," responded Kathy. "What do you do with the clues?" "Use them to get more information," Tanya asserted.

Later that day Nick struggled with a Mind Bender for about fifteen minutes:

> *Klare, Lemon, Morton, and Nelson are women who love their work (dress designer, florist, gardener, symphony conductor). From the clues below, match up each woman's name with her kind of work.*
> 1. *Klare is violently allergic to most plants.*
> 2. *Lemon and the florist are roommates.*
> 3. *Morton and Lemon only like rock music.*
> 4. *The gardener, the dress designer, and Nelson are strangers.*
>
> *(Harnadek, 1981, B1)*

Nick stared at the paper for a long time before he wrote anything on the chart that was provided with the problem. After a few minutes he started to slowly eliminate possibilities by putting X's in the

appropriate squares on the chart. He thought aloud at times, "Hmmmm, that's something I must have missed," and "There, that makes sense." Eventually he solved the problem, and his worried frown was replaced with an eager grin. He proudly showed me his work. "How did you figure it out?" I asked Nick. He explained:

> *I looked and looked. Finally I just looked at every little word. I knew that the clues were there; I just had to figure out how to use them. The final clue was kind of a combination of the second and fourth clues. It was hard because my brain couldn't really handle all of the information at once. The chart helped, but it was still hard because everything had to go through my brain before I could put it on the chart. For a while I just tried different possibilities and then checked to see if they fit in with the clues. But that got me really confused. Finally I just went back to the clues and stared at them until I could make sense out of them.*

Nick's insights into his problem solving techniques heightened his ability to solve other problems and think critically. The emphasis in this classroom on the process of finding the answer helped to make these children aware of the thought processes that they were experiencing. By becoming aware of their thinking the children experienced an additional dimension of cognitive thought.

When the children participated in Stories to Stretch Minds, extended riddles which ended each class period, they examined their own thinking to analyze and synthesize information so that they could solve problems and puzzles. Sometimes Kathy had to lead them towards this examination of their thinking. When the children were struggling with Silly Milly, their initial questioning was haphazard and unstructured:

> *Milly is silly, but not ridiculous. She's funny and sorry, but not humorous. She eats apples but not pears. She'll attend a rally, but not a party. She'll cut with a scissor, but not a knife. (Levy, 1982, p. 6)*

No one was taking any notes about what Silly Milly liked and what she didn't like. A written record of the dislikes and likes probably would have expedited the children's discovery of the answer. After the third session with this puzzle, it became apparent that the children's questioning was random and purposeless. "Try to generalize, categorize," Kathy urged. "You have to figure out the criteria." Will was very confused by the problem. "I don't get the question," he worried. "What are we trying to figure out?" Helena enlightened him. "We have to figure out why she only liked certain things," she explained. "Because half her brain is defective," Marty quipped. "Let's try to get some more information," Susan suggested. "Let's try to organize the information that we already have," Nick said. The questioning continued, and Kathy became a little more liberal in supplying clues. When the children started asking about who Milly liked, they experienced a breakthrough. "Does she like Peg?" Vanessa asked. "No," Kathy told her, "but she likes Peggy." "Does she like Sam?" Scott queried. "No," Kathy answered, "but she likes Sammy, and she likes Scott and she likes Vanessa." "Does she like Jessica and Will?" asked Susan excitedly. "Yes, yes," said Kathy, also excited. "Then I've got it!" Susan exclaimed. "She only likes things that have two letters that are the same. You know, double

letters." I could see the dawn of discovery in the eyes of the other children as they reconsidered the clues that Susan had put together to solve the puzzle. "That's it!" Kathy congratulated Susan. "Good work." I talked with Susan the next week about the evolution of her thought process:

Researcher: What were you thinking about last week when you came up with the right answer for Stories to Stretch Minds?

Susan: (hesitates) Well, the different words, like Sam and Sammy, Peg and Peggy. They had two syllables, but wall didn't, and she liked walls, so I knew that wasn't it. Mostly I was thinking about the words and what they sounded like.

Researcher: How did you feel when Mrs. Knight first presented the problem?

Susan: I thought it was hard.

Researcher: How did that make you feel?

Susan: Like it was a challenge. I like challenges. It was fun to try to put clues together.

Researcher: How did you put the clues together.

Susan: Well, first I guess I was thinking about what the words meant. You know, like things to eat or part of a house or people's names. But that didn't make any sense, so I started thinking about the letters and the syllables. Then I knew it wasn't syllables because she liked walls and that just has one syllable. That's when I figured out that all of the things that she [Silly Milly] liked had double letters in them.

Researcher: How did you feel when you figured out the answer?

Susan: I felt good. I was glad that I finally figured it out. After I got the answer, it seemed so easy.

Use of Reference Materials

One suggested purpose of questioning is to guide children to gather facts to support their ideas (Hunkins, 1972). Much of the interaction that children in this class had with reference materials and worksheets was geared toward that objective. They answered questions to reinforce their research skills and to begin to establish a data base for development of subsequent ideas. They were never expected to memorize any of the answers that they found, but to understand them in the context of the research they were doing, and to know which sources were the best to explore to answer their particular questions.

Trek for Trivia was an activity which required the use of research materials to find answers to specific questions about geography, history, mathematics, and word derivations. Children became engrossed in encyclopedias, atlases, dictionaries, and almanacs to find answers to questions that would subsequently provide a coded message.

When children were stymied by Center activities, Kathy would provide them with guidance and direction, but rarely answers. Tanya struggled to complete a page from Trek for Trivia for several class periods. She eventually appealed to Kathy for help.

Tanya: I can't get this.

Kathy: What have you tried?

Tanya: I looked on the globe and in the encyclopedia.

Kathy: What did you find?

Tanya: Well, I guess maybe it could be the Philippines. They're in the South Pacific.

Kathy: Does that fit in with the letter clues?

Tanya: No, that's the problem. I don't know where else to look for the answer.

Kathy: Vanessa is stuck on the same one. Why don't you girls try putting your heads together? Try looking in the geographical dictionary and the atlas also.

Marty joined the girls in their quest, but the youngsters were unsuccessful in finding an answer that fulfilled the definition and fit into the coded message. Kathy eventually became active in the search for information and helped the children to find the required answer. The emphasis was continually on the process of using research materials to locate information, although the children were rewarded with the satisfaction of finding the right answer.

Conclusions

The questioning that took place in this classroom seemed to belie the hierarchal nature of Bloom's taxonomy. Knowledge, the first level of the taxonomy, was a necessary prerequisite for the thinking in which the children engaged, but it was not subordinated by the other levels of the taxonomy. The types of questions that were asked suggested constant interaction between the levels of the taxonomy. Knowledge in this classroom was not presented to students by the teacher. Rather, the students generated and created their own knowledge through the application, analysis, synthesis, and evaluation of ideas. All levels of the taxonomy coexisted on the same plane in this classroom. Children asked and answered questions that merged and unified Bloom's categories, usually under the umbrella of metacognition, a conscious awareness of the thinking process.

The use of the type of questioning strategies described above can provide focus and raise the level of students' thinking. Questions can act as a catalyst, stimulate students' critical thinking processes, and give them a way to organize their ideas. Effective questioning strategies can "serve in lifting the level of thought in the learning process" (Hunkins, 1972, p. 10). The questioning that took place in this classroom was designed to achieve this purpose. Examples of the thinking that the children verbalized in response to the different types of questioning that occurred in the class indicated that their critical thinking processes were indeed stimulated and developed by the use of open-ended questions or questions which required deductive reasoning or the exploration of research materials.

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